

D. ANNOTATED MARKED-UP DRAWINGS
WITH ATTACHMENT REPLACEMENT SHEETS
AND FORMAL DRAWINGS

Proposed amendments to FIGS. 7, 21, 26, 31, 61, 68, 76, 131 and 148 are provided to bring the drawing into conformance with the specification.

Additionally, formal drawings are presented for approval.

RESPONSE

This Amendment is responsive to the First Office Action on the merits in this matter, mailed June 2, 2003. In view of the amendments and the remarks made herein, the applicant respectfully requests reconsideration and further examination of this application.

In response to the various objections and rejections set forth in the Official Action, the specific remarks are set forth below.

REMARKS

The examiner has raised the following issues:

1. Rejection Based on Obviousness Type Double Patenting

The Examiner has rejected claims 1-24, 79 and 80 of the present application under the judicially created doctrine of obviousness-type double-patenting, as being unpatentable over claims 1-24 of U.S. Patent No. 6,230,537 issued May 15, 2001. That prior patent remains commonly owned with the instant application. Accordingly, a "Terminal Disclaimer" is filed herewith to obviate the obviousness type double patenting rejection. Thus, this basis of rejection is now believed moot, and it is respectfully requested that this basis of rejection be withdrawn.

2. Rejection Based on Statutory Type Double Patenting

Next, the Examiner has rejected claims 36, 39, 41, 42, 43, 44 and 45 of the present application under USC § 101, as claiming the same invention as that of claims 21, 24, 26, 27, 28, 29, and 30 of the applicant's prior U.S. Patent No. 6,389,865 issued May 21, 2002. After further review of these claims and the cited issued patent, the applicant has herein cancelled claims 36, 39, 41, 42, 43, 44, and 45 in the instant application. Consequently, it is believed that this basis of rejection is now moot. It is therefore respectfully requested that this basis of rejection be withdrawn.

3. Rejection Based on Obviousness Type Double Patenting

Next, the Examiner has rejected claims 37, 38 and 40 of the present application under the judicially created doctrine of obviousness-type double-patenting, as being unpatentable over claims 22 and 23 of U.S. Patent No. 6,389,865 issued May 21, 2002. As the examiner pointed out, the conflicting claims are not identical. Claims 37, 38, and 40, as each has been amended herein, are similar to claims 22, 23, and 45, respectively in the cited prior patent. That prior patent remains commonly owned with the instant application. Accordingly, a "Terminal Disclaimer" is filed herewith to obviate the double patenting rejection. Thus, this basis of rejection is now believed moot, and it is respectfully requested that this basis of rejection be withdrawn.

4. Rejection Based on Obviousness Type Double Patenting

Next, the Examiner has rejected claims 77 and 78 of the present application under the judicially created doctrine of obviousness-type double-patenting, as being unpatentable over claim 21 of U.S. Patent No. 6,389,865 issued May 21, 2002 in view of Wong (Canadian document No. 2,121,120). The cited patent remains commonly owned with the instant application. Accordingly, a "Terminal Disclaimer" is filed herewith to obviate the double patenting rejection. Thus, this basis of rejection is

now believed moot, and it is respectfully requested that this basis of rejection be withdrawn.

**5. REJECTION UNDER 35 U.S.C. SECTION 102(b)
As Being Anticipated By Hanna, U.S. Pat. No. 2,810,191**

Next, claims 25, 26, 29 and 30 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Hanna '191. In response, the applicant has amended claims 25 and 26 to include several novel and unobvious aspects of one embodiment of the present invention, namely that (1) a selected shaped surface profile is provided for an indenter so that the surface being indented does not appreciably increase in thickness of the structure when the contacting end of the indenter is engaged with a first surface, and (2) a substantially uniform residual compressive stress profile is provided along a sidewall of a hole installed in the structure.

Also, although the examiner has directed attention to FIG. 3 of Hanna, it must be noted that the stresses shown in FIG. 3 of Hanna are the stresses resulting from the applied load, and thus that figure indicates only how the peak stresses are reduced, but does not indicate a beneficial residual stress profile per se. Further FIGS. 5, 6, and 7 of Hanna clearly indicate how surface upset and increased thickness of a structure are experienced by use of the tooling taught by Hanna in the method taught by Hanna.

The cited reference does not teach every aspect of the invention, as set forth in the presently amended claims, either explicitly or impliedly. Importantly, a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art

reference. *Verdegall Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Also, see MPEP § 2131. Here, the limitations now included in the amended claims clearly distinguish these claims from the cited reference. Accordingly, rejection based on 35 U.S.C. Section 102 is not proper, and thus it is respectfully requested that this basis of rejection be withdrawn with respect to claims 25 and 26.

Rejection of claims 29 and 30 is even less appropriate, since each and every limitation is not contained in the combination of these dependent claims and their parent claim 25. Thus, rejection based on 35 U.S.C. Section 102 as being anticipated is not proper, and thus it is respectfully requested that this basis of rejection be withdrawn with respect to claims 29 and 30.

In summary, it is respectfully requested that the rejection of claims 25, 26, 29, and 30 be based on 35 U.S.C. § 102(b) be removed.

**6. REJECTION UNDER 35 U.S.C. SECTION 102(b)
As Being Anticipated by Wong,
Canadian Published Patent Application No. 2,121,120**

Next, claims 25-30 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Wong '120. In response, the applicant has amended claims 25 and 26 to include several novel and unobvious aspects of one embodiment of the present invention, namely that (1) a selected shaped surface profile is provided for an indenter so that the surface being indented does not appreciably increase in thickness of the structure when the contacting end of the indenter is engaged with a first surface,

and (2) a substantially uniform residual compressive stress profile is provided along a sidewall of a hole installed in the structure.

Also, although the examiner has directed attention to FIG. 17 of Wong, it must be noted that Wong does not disclose the development of a substantially uniform residual compressive stress along the sidewall of a hole in a metal plate. At page 6, lines 1-3 of Wong, reference is made to FIG. 17 which discloses a joint having three layers of material, with holes and cold working either prior art to Wong or via the Wong invention, is disclosed. Thus, it does not disclose the manufacture of a metal plate via use of indenters wherein a substantially uniform residual compressive stress profile is provided along the sidewall of a hole, as set forth in claims 25 and 26. The dog-bone shown in FIG. 14 of Wong was compressed via load on either side of the dog-bone, as noted at page 9, lines 22-27 of Wong, but again, no description was provided by Wong of a technique suitable for providing a substantially uniform residual compressive stress profile, as now claimed herein along a hole formed in such a structure. Although Wong discloses, at page 10, lines 18-22, the use of residual compressive stress at a hole perimeter, Wong again fails to described a tool or a technique suitable for providing a substantially uniform residual compressive stress profile along the sidewall of a hole.

In short, the cited reference does not teach every aspect of the invention, as set forth in the presently amended claims, either explicitly or impliedly. Importantly, a claim is anticipated only if each and every element as set forth in the

claim is found, either expressly or inherently described, in a single prior art reference. *Verdegall Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Also, see MPEP § 2131. Here, the limitations now included in the amended claims clearly distinguish these claims from the cited reference. Accordingly, rejection based on 35 U.S.C. Section 102 is not proper, and thus it is respectfully requested that this basis of rejection be withdrawn with respect to claims 25 and 26.

Rejection of claims 27-30 is even less appropriate, since each and every limitation of the parent claims is contained in the combination of these dependent claims and their parent claim 25. Thus, rejection based on 35 U.S.C. Section 102 as being anticipated is not proper, and thus it is respectfully requested that this basis of rejection be withdrawn with respect to claims 27-30. And, in any event, these claims are dependent on novel and unobvious parent claims, and thus are patentable.

In summary, it is respectfully requested that the rejection of claims 25, 26, 27, 28, 29, and 30 under 35 U.S.C. § 102(b) based on Wong, Published Canadian Patent Application No. 2,121,120, be removed.

**7. REJECTION UNDER 35 U.S.C. SECTION 102(b)
As Being Anticipated by Salter, U.S. Pat. No. 3,270,410**

Next, the examiner has rejected claim 54 under 35 U.S.C. § 102(b) as being anticipated by Salter. Claim 54 has been amended to particularly point out that in the instant invention a substantially uniform residual compressive stress is provided, before hole formation, in a bounding portion adjacent the edge

wall of a hole subsequently installed through a first member of a structure. This is an important distinction from joints provided by prior art techniques, whether as taught by Salter or otherwise. As described in the enclosed declaration of the inventor in this application, joints manufactured via the claimed technique can be easily distinguished from those manufactured by prior art processes if inspected (1) after indentation but prior to hole installation, when made by the process of the present invention, or (2) or after hole installation and after fatigue life improvement treatment, if by the Salter technique or by a split mandrel technique, for example. Importantly, even if after (a) hole installation, (b) use of a prior art fatigue life enhancement treatment method, and (c) refinishing of the hole, such treatment can be seen by more advanced inspection techniques, such as a non-destructive technique of x-ray diffraction.

Further, Salter does not illustrate or otherwise teach the use of a substantially uniform residual compressive stress adjacent in the bounding portion adjacent the hole edge wall, even though it does show the use of residual compressive stress in both members of a joint.

In summary, the cited Salter et al '410 reference does not teach every aspect of the invention, as set forth in the presently amended claims, either explicitly or impliedly. As earlier noted herein above, a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. See MPEP § 2131. Here, the limitations now included

in the amended claims clearly distinguish these claims from the cited reference. Accordingly, rejection based on 35 U.S.C. Section 102 is not proper, and thus it is respectfully requested that this basis of rejection be withdrawn with respect to claim 54.

**8. REJECTION UNDER 35 U.S.C. SECTION 102(b)
As Being Anticipated by Cox, U.S. Pat. No. 5,059,059**

Next, claims 54 and 55 stand rejected by the examiner under 35 U.S.C. §102(b) as being clearly anticipated by Cox '059. As noted in item 7, claim 54 has been amended to particularly point out that in the instant invention a substantially uniform residual compressive stress is provided, before hole formation, in a bounding portion adjacent the edge wall of a hole subsequently installed through a first member of a structure. This is an important distinction from joints provided by prior art techniques, including the technique taught by the Cox '059 reference. As described in the enclosed declaration of the inventor in this application, joints manufactured via the claimed technique can be distinguished from those manufactured by prior art processes. The Cox reference teaches use of "either a coining mandrel or a split sleeve" to enlarge a pre-formed hole in a structure such as an airplane skin. See Cox at col. 3, lines 12-13.

Thus, the cited Cox '059 reference does not teach every aspect of the invention, as set forth in the presently amended claims, either explicitly or impliedly. As earlier noted herein above, a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently

described, in a single prior art reference. See MPEP § 2131. Here, the limitations now included in the amended claim 54 clearly distinguishes claims 54 and 55 from the cited Cox '059 reference. Accordingly, it is respectfully requested that this basis of rejection be withdrawn with respect to claims 54 and 55.

**9. REJECTION UNDER 35 U.S.C. SECTION 103(a)
As Being Obvious over Cox, U.S. Pat. No. 5,059,059**

Next, claim 56 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over the Cox '059 patent. Rejection of claims 56 is even less appropriate, since each and every limitation of the parent claim is contained in the combination of this dependent claim its parent claims 55 and 54. Thus, rejection based on 35 U.S.C. Section 103(a) as being obvious is improper, as this claim 55 is dependent on novel and unobvious parent claims, and is thus even less obvious. Consequently, it is respectfully requested that this basis of rejection be withdrawn.

**10. REJECTION UNDER 35 U.S.C. SECTION 103(a)
As being Obvious in view of Wong
Canadian Published Patent Application No. 2,121,120**

Finally, claims 74 and 75 were rejected under 35 U.S.C. § 103(a) as being obvious over the Wong '120 reference. The applicant respectfully disagrees. First, attention is directed to FIG. 136 of this application and related portions of the specification, especially page 31, lines 1-5, where the use of the claimed technique is described for the treatment of gears, turbine rotors, and other components where there is a need for fatigue life enhancement at stress concentration locations

adjacent to a slot feature. In contrast, at page 4, paragraph 4 of his disclosure, Wong only teaches the use of indenters (he uses the term mandrels) of various cross-sectional shape to make a hole of any desired shape. The discussion is with respect to a sheet component, and in no respect does Wong teach or suggest the application of an indenter technique to a rotating machinery part such as a gear or turbine rotor, much less in the portion of such a component where a slot such as a gear slot or a turbine blade mounting slot is formed, rather than a hole. The additional and further expansion of the use of indenters to create beneficial residual compressive stress in slot containing components cannot be fairly characterized as merely a matter of choice of one of ordinary skill in the art. Nothing in Wong teaches or suggests the application of his technique to such rotating equipment. At most, Wong suggests the application of his technique to ship components, and to process vessels and containers, to motor vehicles, or to sports equipment. (see Wong, page 4, lines 1-15.) Consequently, Wong neither teaches or suggests the application of his technique to the subject matter set forth in claims 74 and 75.

To establish prima facie obviousness of a claimed invention, (a) all of the claim limitations must be taught or suggested by the prior art, and (b) there must be a reasonable expectation of success. Here, Wong does not teach or suggest the application of his technique to rotating machinery such as gears or turbine rotors. Importantly, all of the words in a claim must be considered in judging the patentability of that claim against the prior art. The teaching or suggestion to make the claimed

invention must be found in the prior art. Here, the treatment of a rotating component to improve fatigue life of the component is not taught or suggested by the cited reference. The test is not whether the differences would have been obvious, but whether the claimed invention as a whole would have been obvious. See MPEP Section 2142. Moreover, the examiner may not ignore material limitations set forth in the claims. Since the prior art reference does not teach or suggest all of the claim limitations, as presented, it is respectfully submitted that a prima facie case of obviousness has not been made out by the examiner. Consequently, it is respectfully requested that this basis of rejection be withdrawn.

11. INFORMATION DISCLOSURE STATEMENT

An Information Disclosure Statement is being submitted herewith.

12. AMENDMENTS TO THE SPECIFICATION

Amendments made to the specification to correct minor typographical errors, and/or to conform the specification with the disclosure of the drawing.

13. AMENDMENTS TO THE DRAWING

Annotated marked-up drawings with attached replacement sheets are provided for various sheets of the drawing. These changes are straightforward and self explanatory.

14. REQUEST FOR CORRECTION

In Form PTO-892 included as part of Paper No. 4, at item E reference is made to US-3,803,989, 04-1974, Kuckhermann et al., in classification 493/318. This appears to the undersigned to be in error, and it is suspected that the proper reference should have been to US-3,803,898, issued to Speakman. Correction and/or clarification is respectfully requested.

SUMMARY

This amendment is in response to the Examiner's Office Action mailed June 2, 2003. For the reasons discussed in detail above, it is believed that this application is now limited to claims which are clearly patentable.

In the event any further issues remain after consideration of this response, the undersigned would welcome a phone call or e-mail in an attempt to resolve outstanding matters and bring the case into condition for allowance.

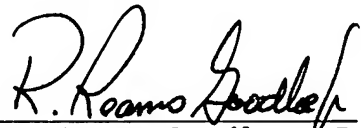
Favorable consideration of this application is therefore believed to be in order and such action is earnestly solicited.

Done at Kent, County of King, State of Washington, on the 2nd day of December, 2003.

Respectfully submitted,

ERIC T. EASTERBROOK

By:


R. Reams Goodloe, Jr.
Reg. No. 32,466

Phone: 253-859-9128

Fax: 253-859-8915

Customer No. 20793

R. Reams Goodloe, Jr.

Reg. No. 32,466

24722-104th Avenue, S.E.
Suite 102
Kent, Washington
98030-5322



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FIG. 6

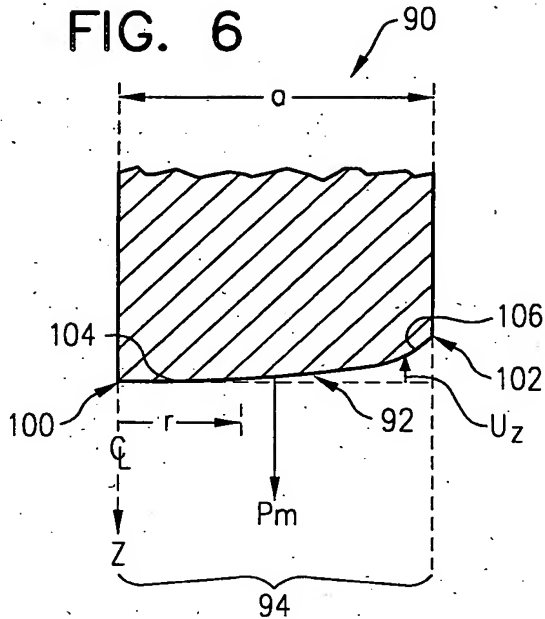


FIG. 7

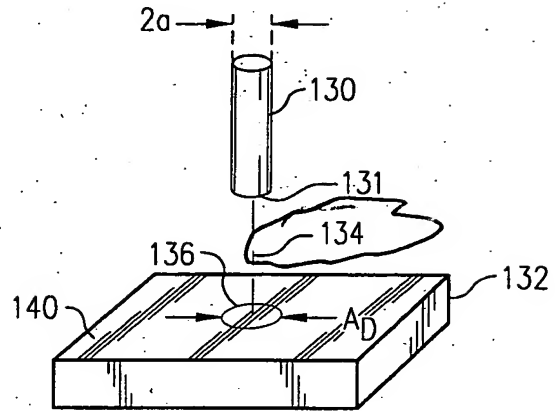


FIG. 9

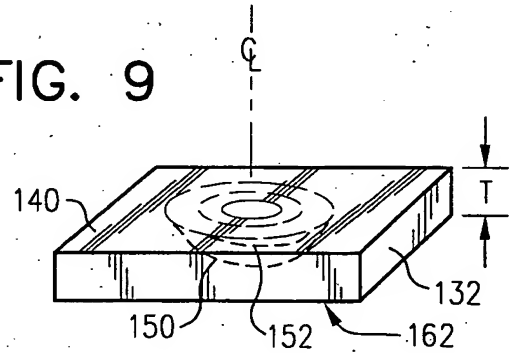


FIG. 8

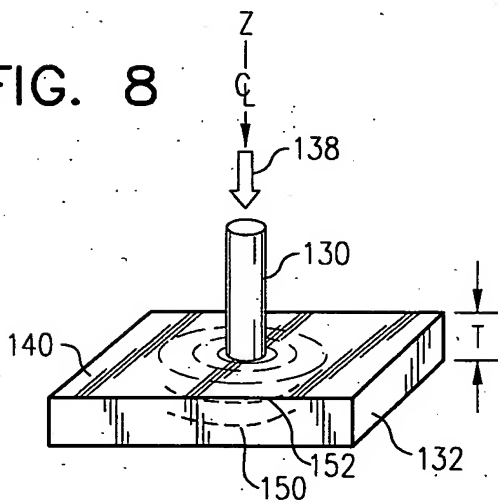


FIG. 10

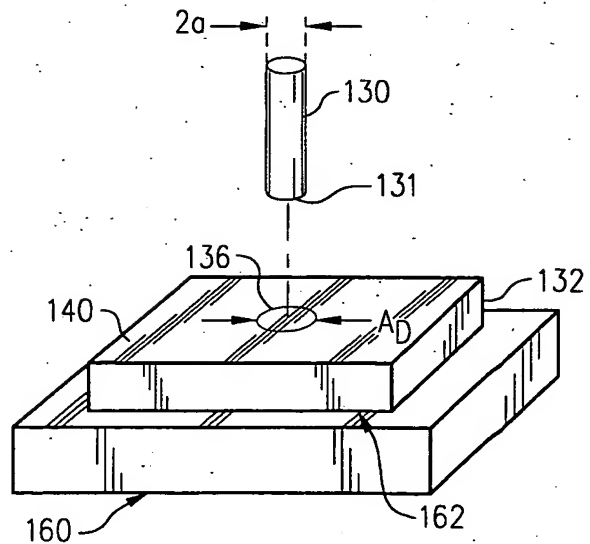




FIG. 21

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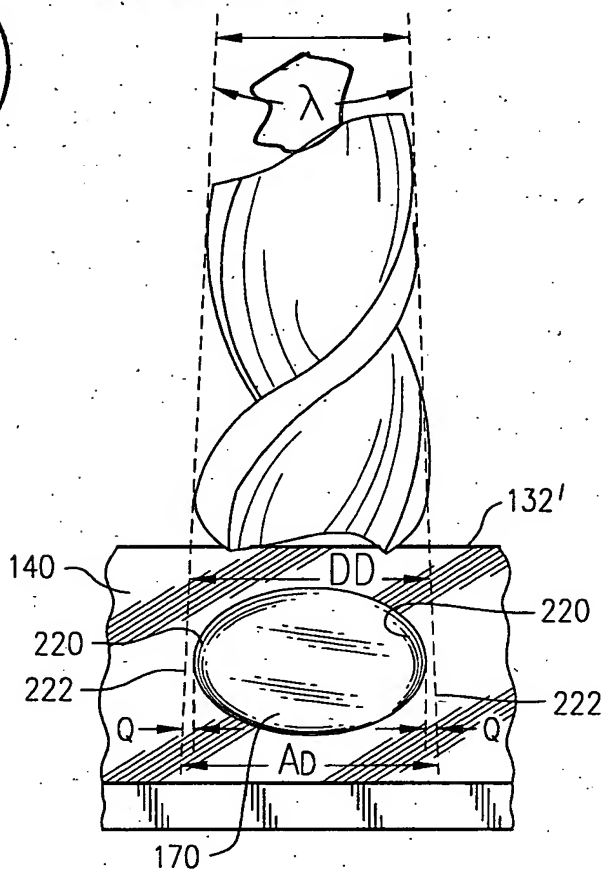


FIG. 22

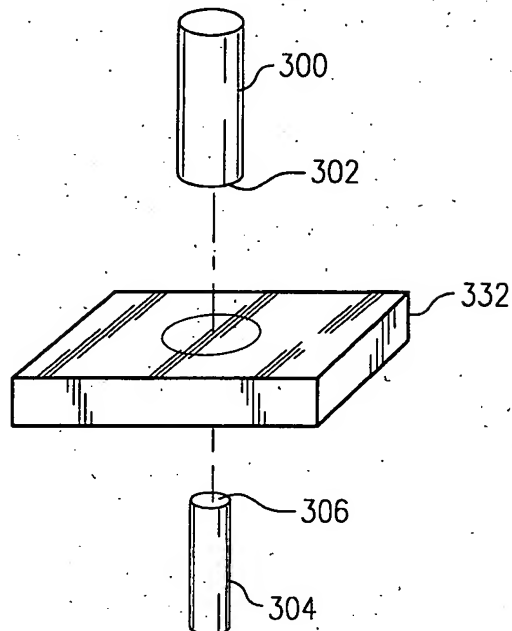


FIG. 24

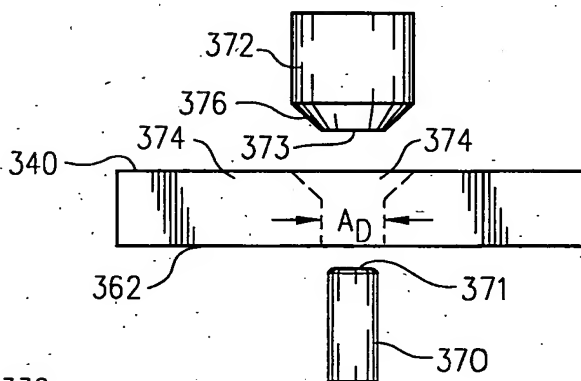


FIG. 23

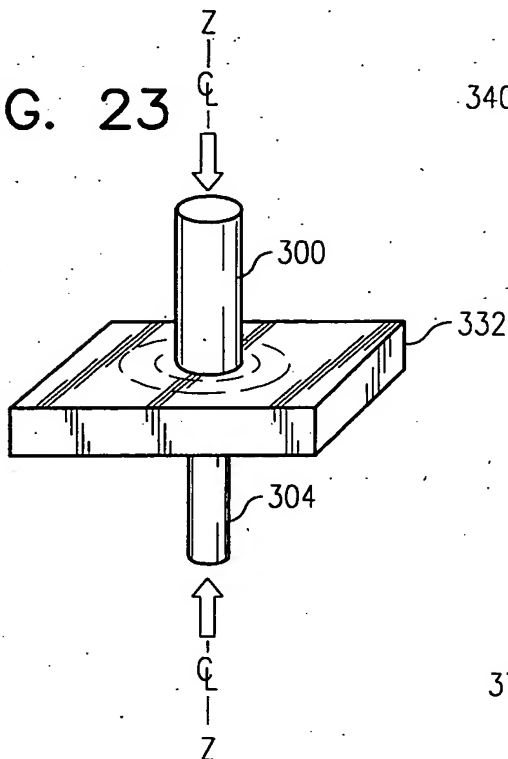
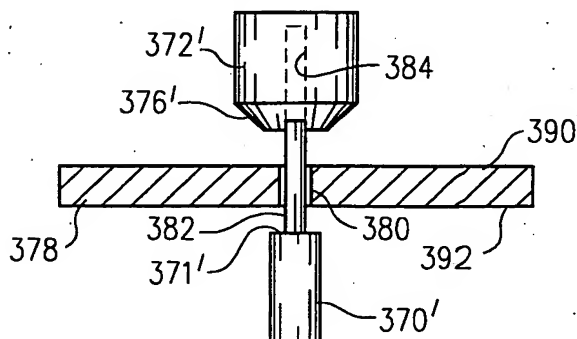


FIG. 25





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FIG. 26

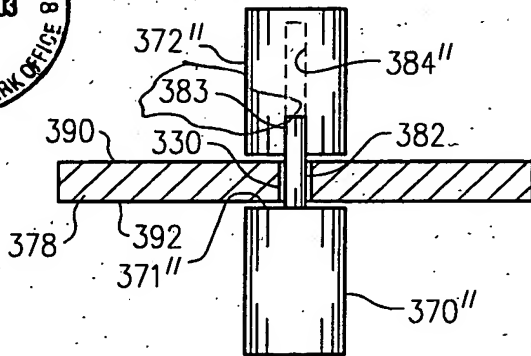


FIG. 27

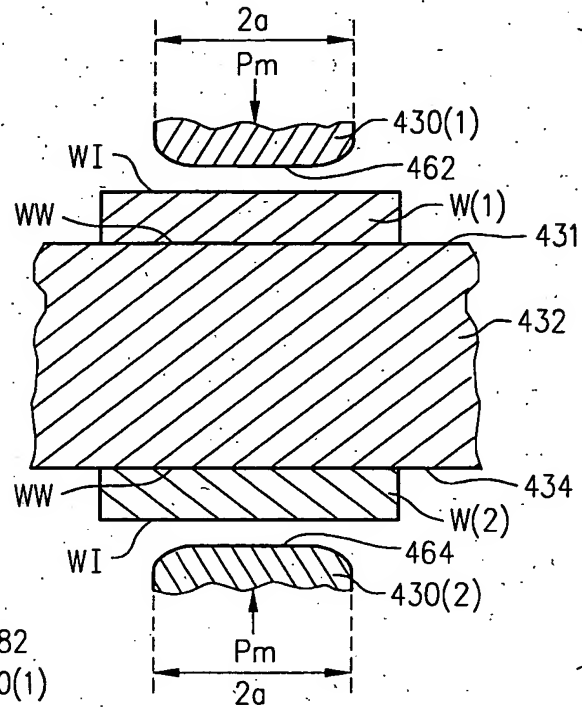


FIG. 28

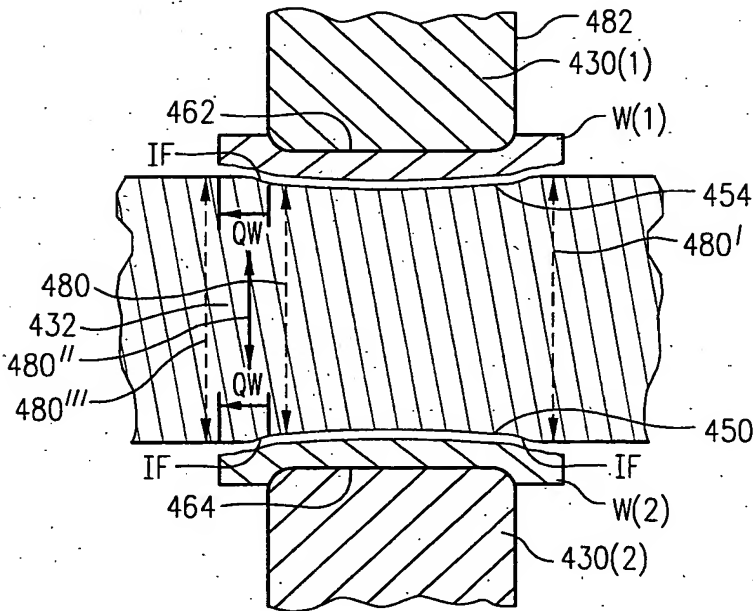


FIG. 32

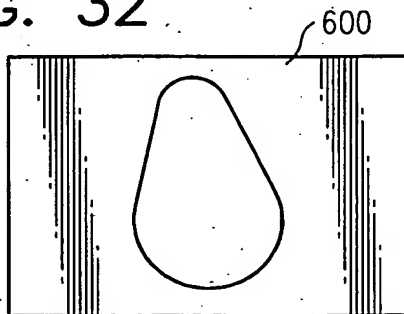
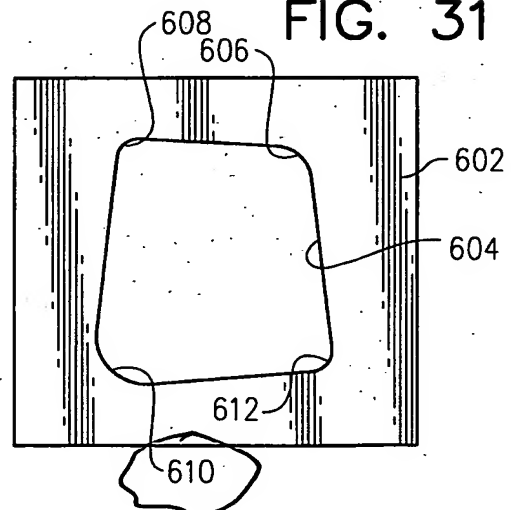


FIG. 31





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FIG. 55

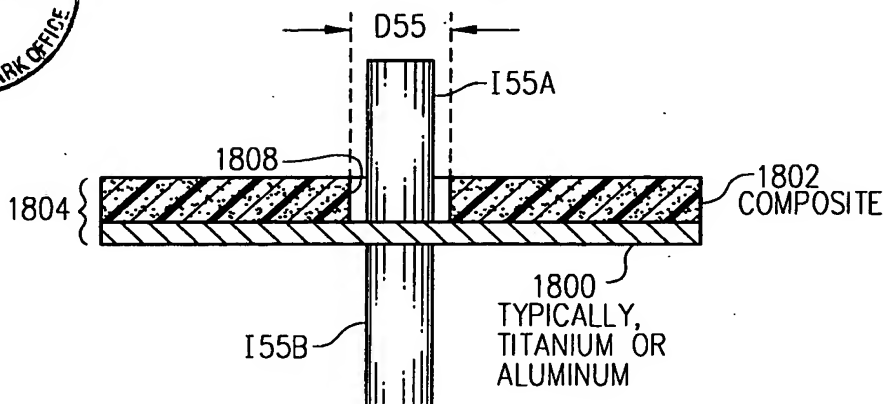


FIG. 56

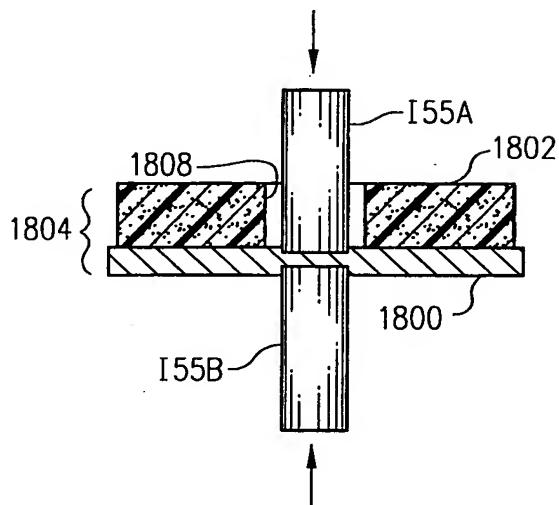


FIG. 57

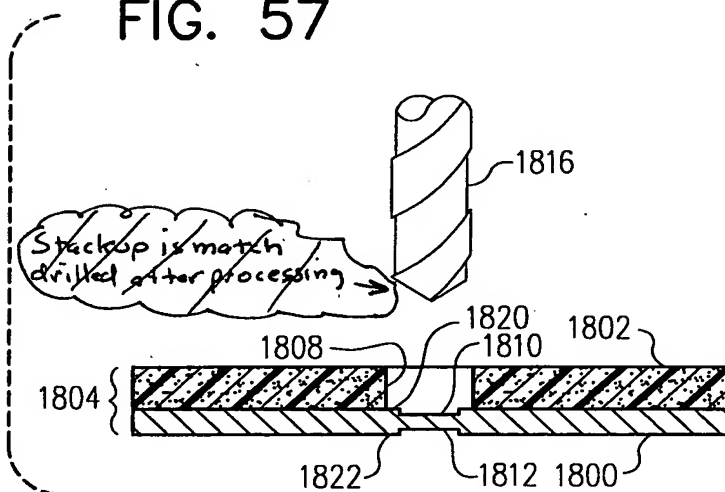
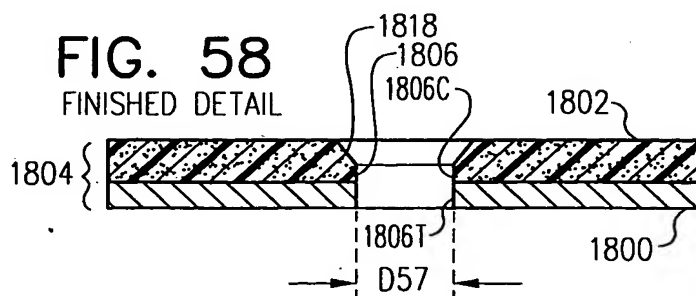


FIG. 58

FINISHED DETAIL





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FIG. 59

TEMPORARY (TACK) FASTENER CONFIGURATION

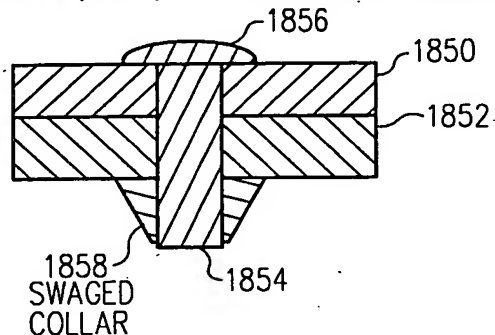


FIG. 60

SHAVE FASTENER HEAD OFF

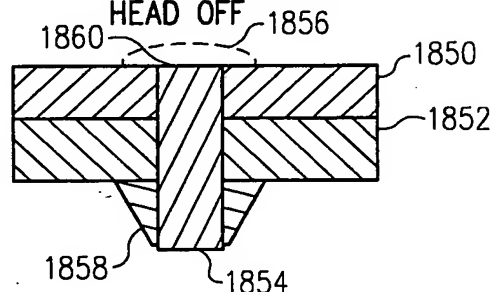


FIG. 61

ALIGN INDENTERS WITH TACK FASTENER CENTER

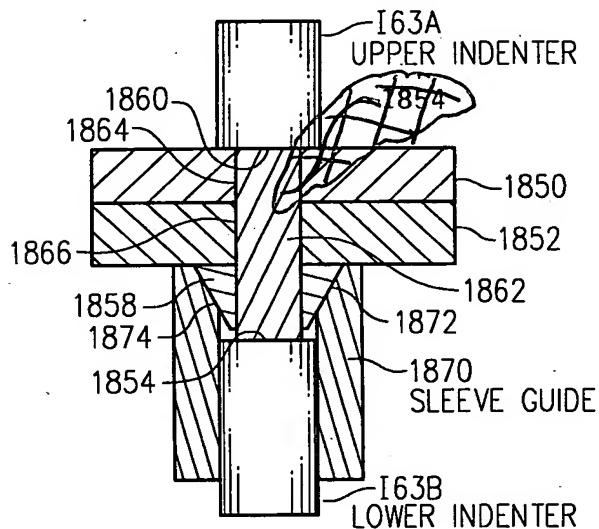


FIG. 62

ACTUATE INDENTERS

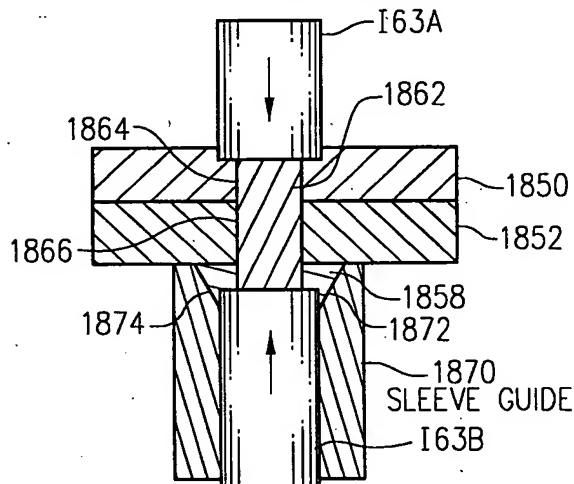


FIG. 63

DRILL TO BOLT DIAMETER

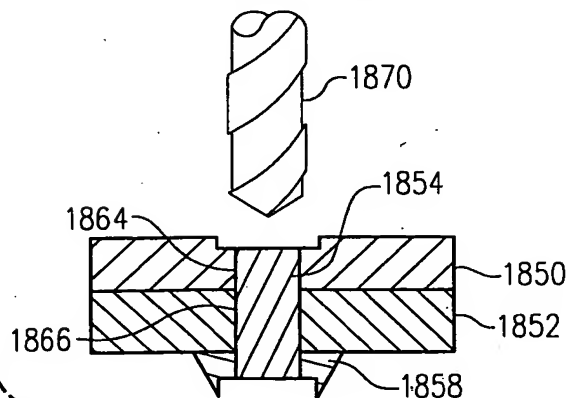
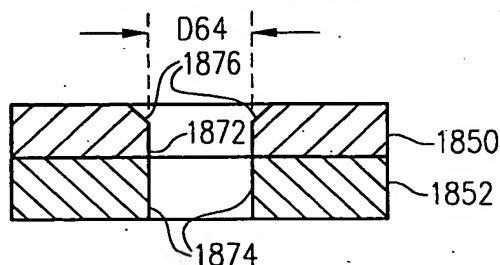


FIG. 64

FINISHED TREATED HOLE



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FIG. 65

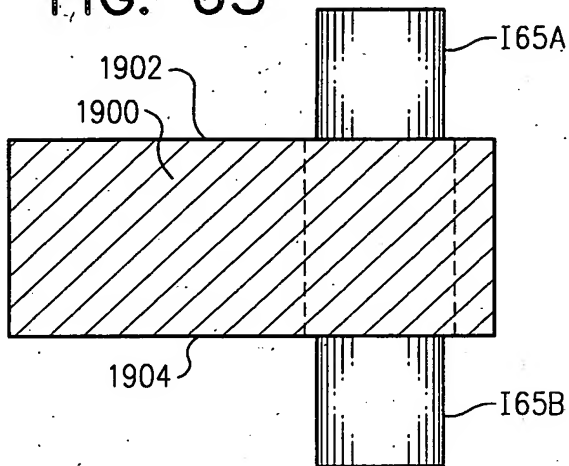


FIG. 66

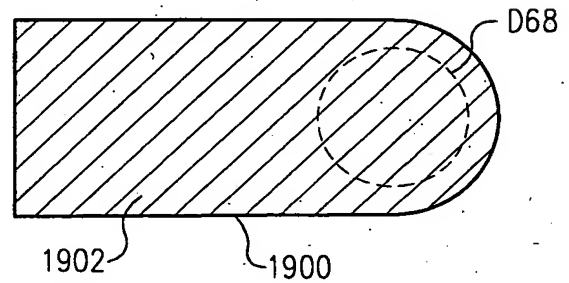


FIG. 67

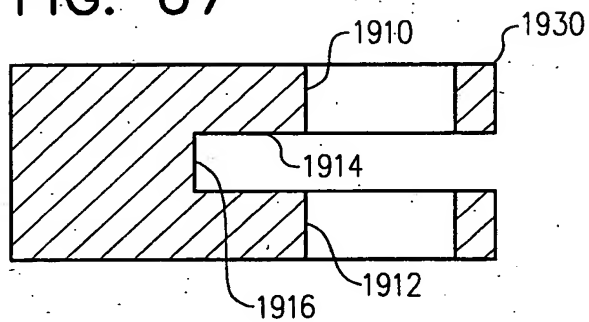
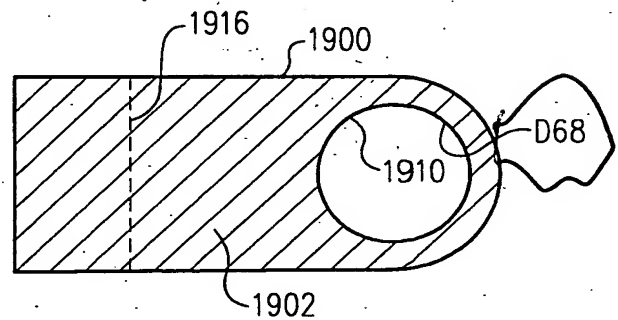


FIG. 68



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CROSS SECTION OF HOLLOW TUBE
TREATED WITH INDENTER END SHAPE
THAT CONFORMS TO TUBE DIAMETER

FIG. 75

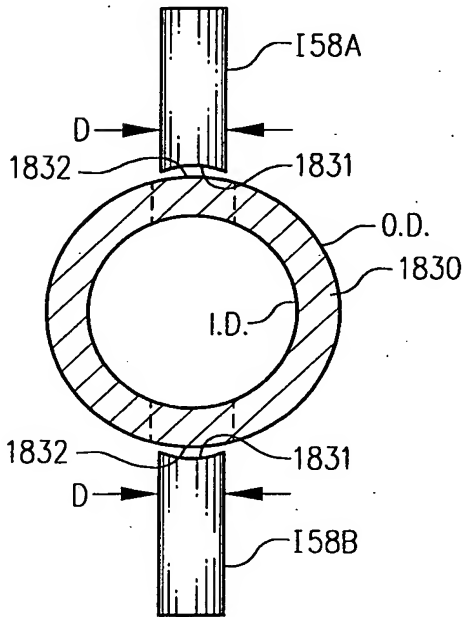


FIG. 76

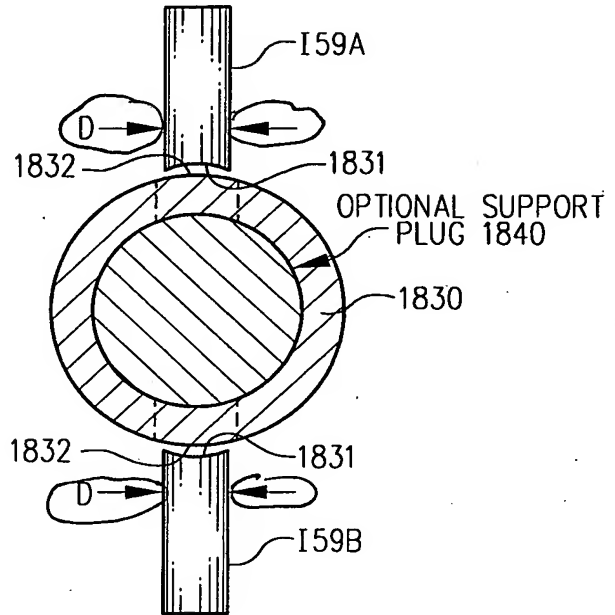
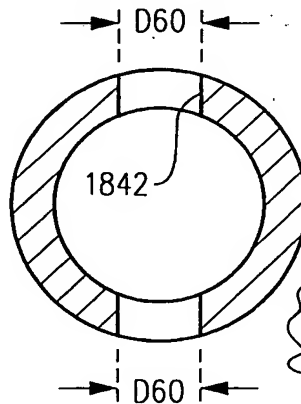
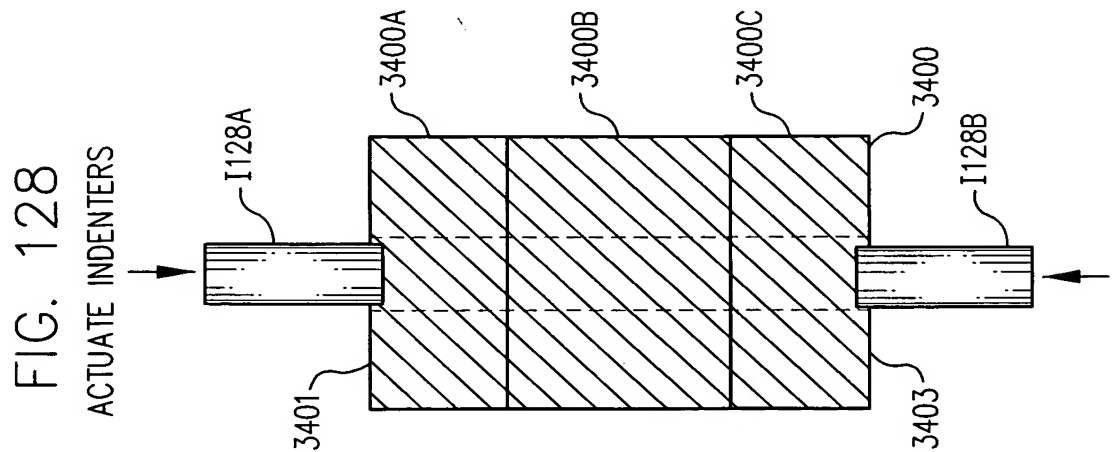
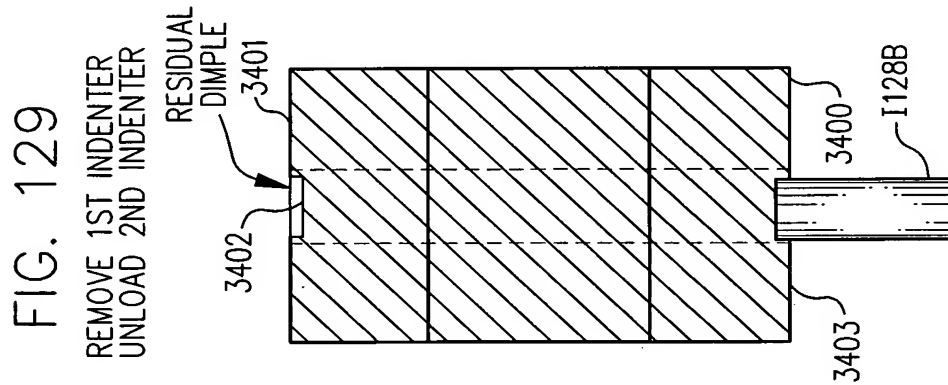
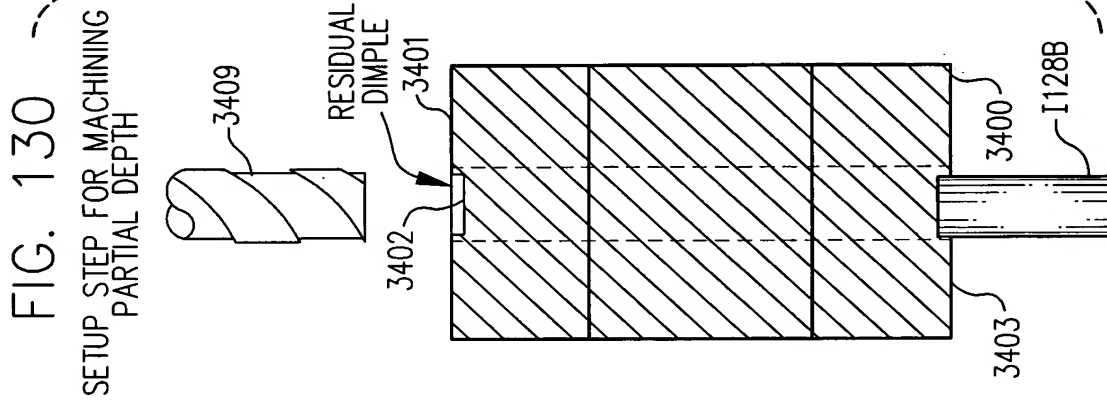
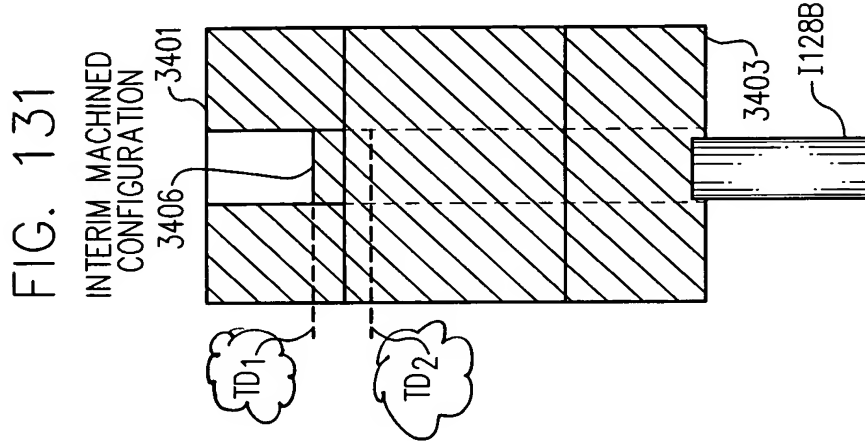


FIG. 77



Cross section of finished
workpiece after
machining holes

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FIG. 145

SETUP STEP FOR TWO INDENTER END STYLES
WITH DRILL ALIGNING FEATURE. ONE CONICAL AND
THE OTHER TRUNCATED CONE

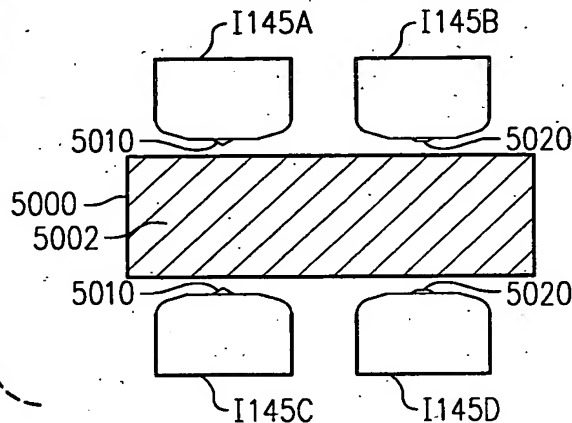


FIG. 146

ACTUATION OF INDENTERS INTO PART

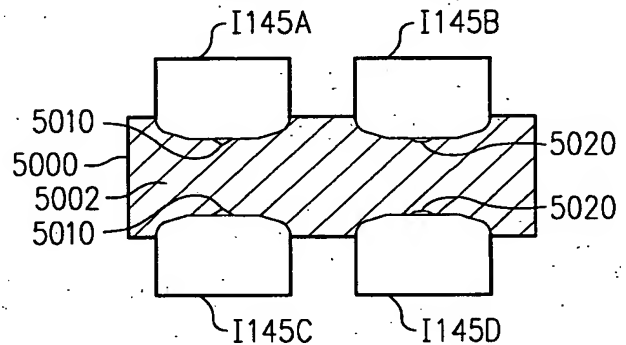


FIG. 147

CROSS SECTION OF DIMPLES
AFTER TREATMENT AND
INDENTER WITHDRAWAL

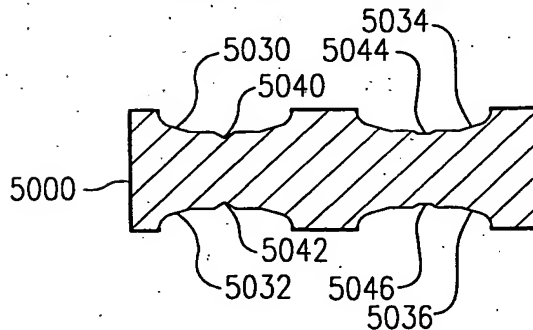
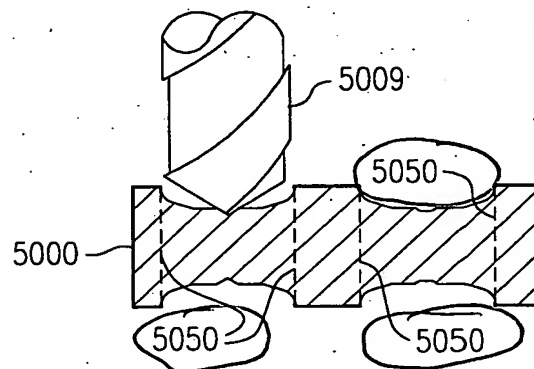


FIG. 148

DRILL OUT HOLE,
DRILL CENTERS ON DIMPLE



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FIG. 149

SETUP STEP FOR TREATING PART
WITH EXTRA THICKNESS USING
INDENTERS MUCH LARGER THAN
THE FINAL HOLE DIAMETER

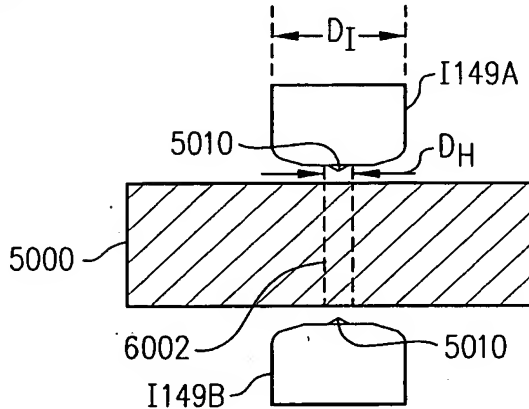


FIG. 150

ACTUATION OF INDENTERS INTO
PART, EXTENT OF RESIDUAL STRESS
WELL BEYOND THE FUTURE WALL OF
THE SMALL DIAMETER HOLE

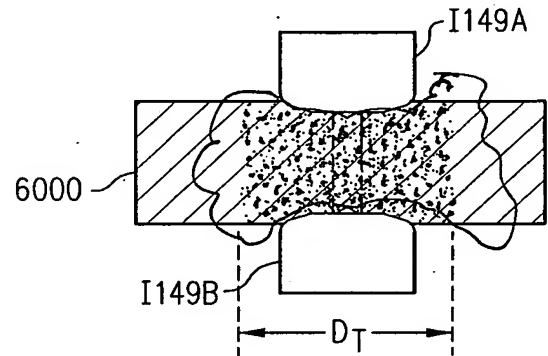


FIG. 151

MILL FRONT AND/OR BACK FACES
OF STRUCTURE TO REMOVE
DIMPLES—RESIDUAL STRESSES
MAY RELAX SLIGHTLY

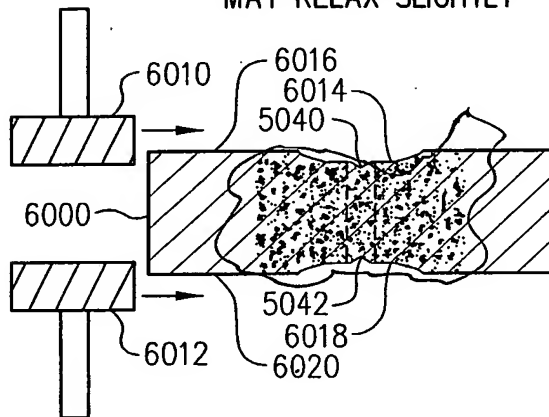


FIG. 152

DRILL OUT HOLE LEAVING
LARGE ZONE OF COMPRESSIVE
RESIDUAL STRESS

